

Wind On The Wires:

*Addressing the Technical and Regulatory
Challenges of Bringing Wind Power to
Market in the Upper Midwest*

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South Dakota Wind Energy Conference

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Pierre, South Dakota



PRESENTATION OVERVIEW

- Background on Wind On The Wires
- Technical (transmission) challenges and work underway
- Regulatory issues and participation
- Wind On The Wires 3 month “to do” list



Wind On The Wires

Background

- **Goal:** overcome barriers to moving wind energy to market – moving from hundreds of megawatts to thousands of megawatts
- **How:** technical work, regulatory involvement, education and outreach
- **Scope:** the Upper Midwest – North and South Dakota, Nebraska, Minnesota, Iowa, Wisconsin and Illinois
- WOW is a partnership with business, local leaders, wind developers, energy experts, and clean energy advocates
- Funded by The McKnight Foundation and The Energy Foundation

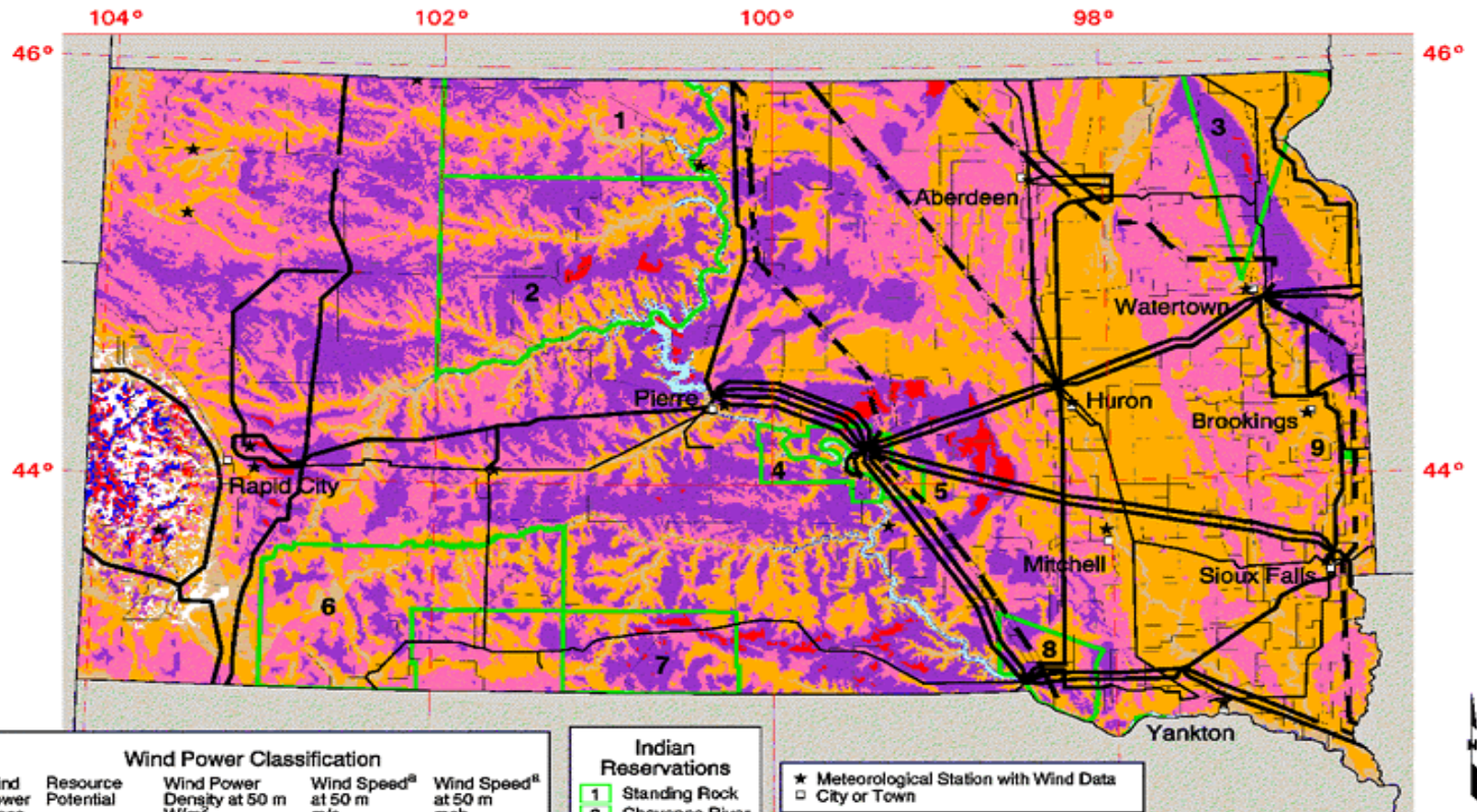
Wind Power in the Midwest

	Nameplate Capacity, MW						Consumption, TWh	
	Development ¹		Total Potential ²	<i>Repowering the Midwest³</i>		State RPS 10% 2010	Actual ⁴ 1998	Projected 2010
	Existing	Planned		2010	2020			1.75%
Illinois	0	130	6,980	423	1,519	5,270	131	162
Iowa	242	259	62,900	1,021	3,817	1,499	37	46
Minnesota	299	164	75,000	1,586	4,474	2,279	57	70
Nebraska	2.8	0.7	99,100	850	2,446	930	23	29
North Dakota	0.4	0.1	138,400	750	2,550	330	8	10
South Dakota	0	4.6	117,200	940	2,900	314	8	10
Wisconsin	53	25	6,440	412	2,778	2,493	62	76
Total	597	583	506,020	5,982	20,484	13,115	327	402

Notes:

1. American Wind Energy Association, July 2001, <http://www.awea.org/>
2. *An Assessment of Windy Land Area and Wind Energy Potential*, Pacific Northwest Laboratory, 1991.
 ≥Class 3, 10Dx5D spacing, 50m hub height, 25% efficiency, 25% losses
 excluded land: 100% environmental, 100% urban, 50% forest, 30% agriculture, 10% range
3. *Repowering the Midwest*, ELPC, 2001, <http://www.repowermidwest.org/?en31>
4. Energy Information Administration, 1998, <http://www.eia.doe.gov/emeu/states/states.html>

South Dakota - Wind Resource Map



Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m ²	Wind Speed ^a at 50 m m/s	Wind Speed ^a at 50 m mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

^a Wind speeds are based on a Weibull k value of 2.0

Indian Reservations

- 1 Standing Rock
- 2 Cheyenne River
- 3 Lake Traverse
- 4 Lower Brule
- 5 Crow Creek
- 6 Pine Ridge
- 7 Rosebud
- 8 Yankton
- 9 Flandreau

- ★ Meteorological Station with Wind Data
- City or Town

Transmission Line Voltage

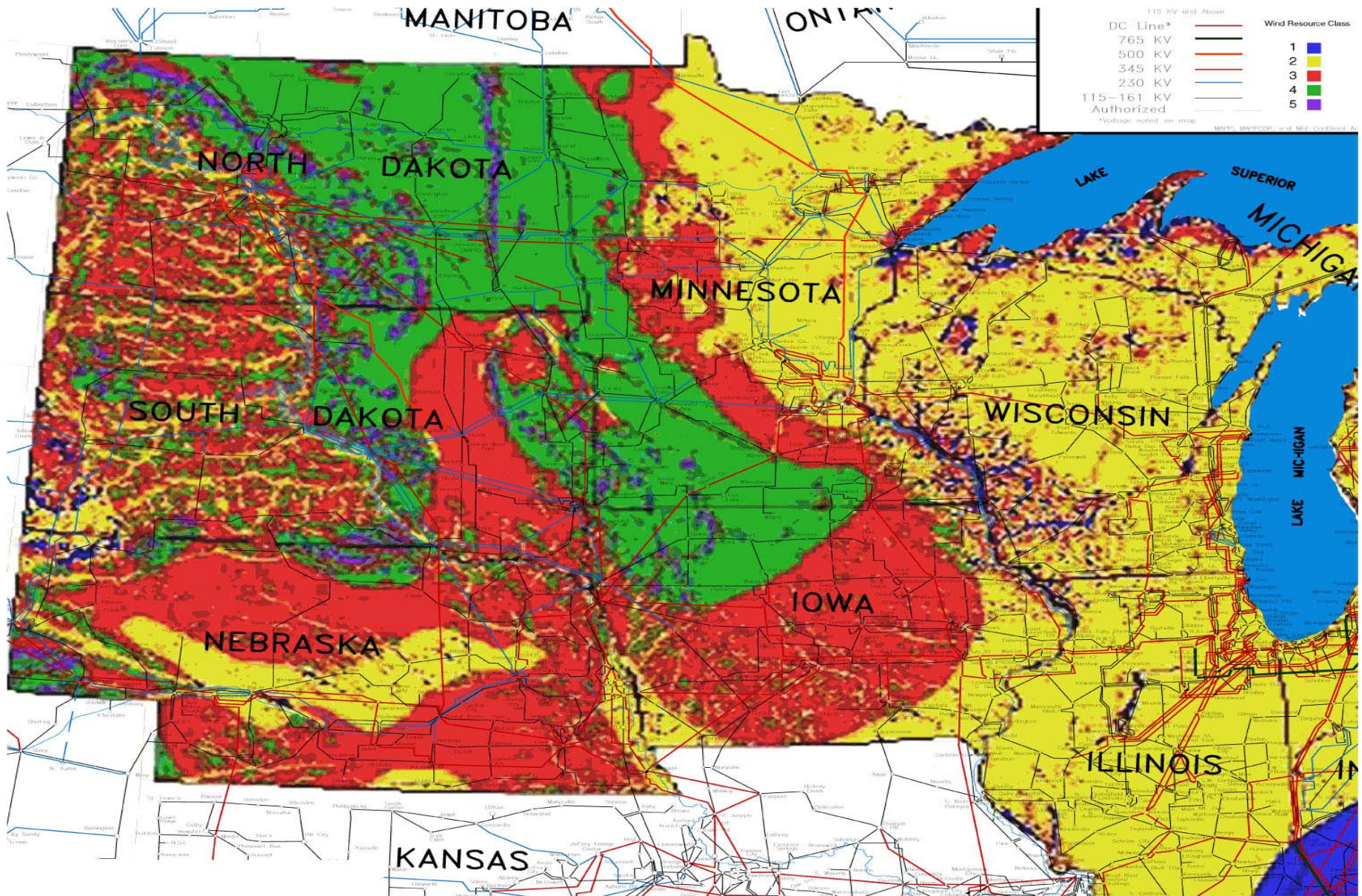
- 69 Kilovolts
- 115 Kilovolts
- 230 Kilovolts
- 345 Kilovolts

50 0 50 100 Kilometers
25 0 25 50 75 Miles

U.S. Department of Energy
National Renewable Energy Laboratory

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Bringing Wind Power to Market



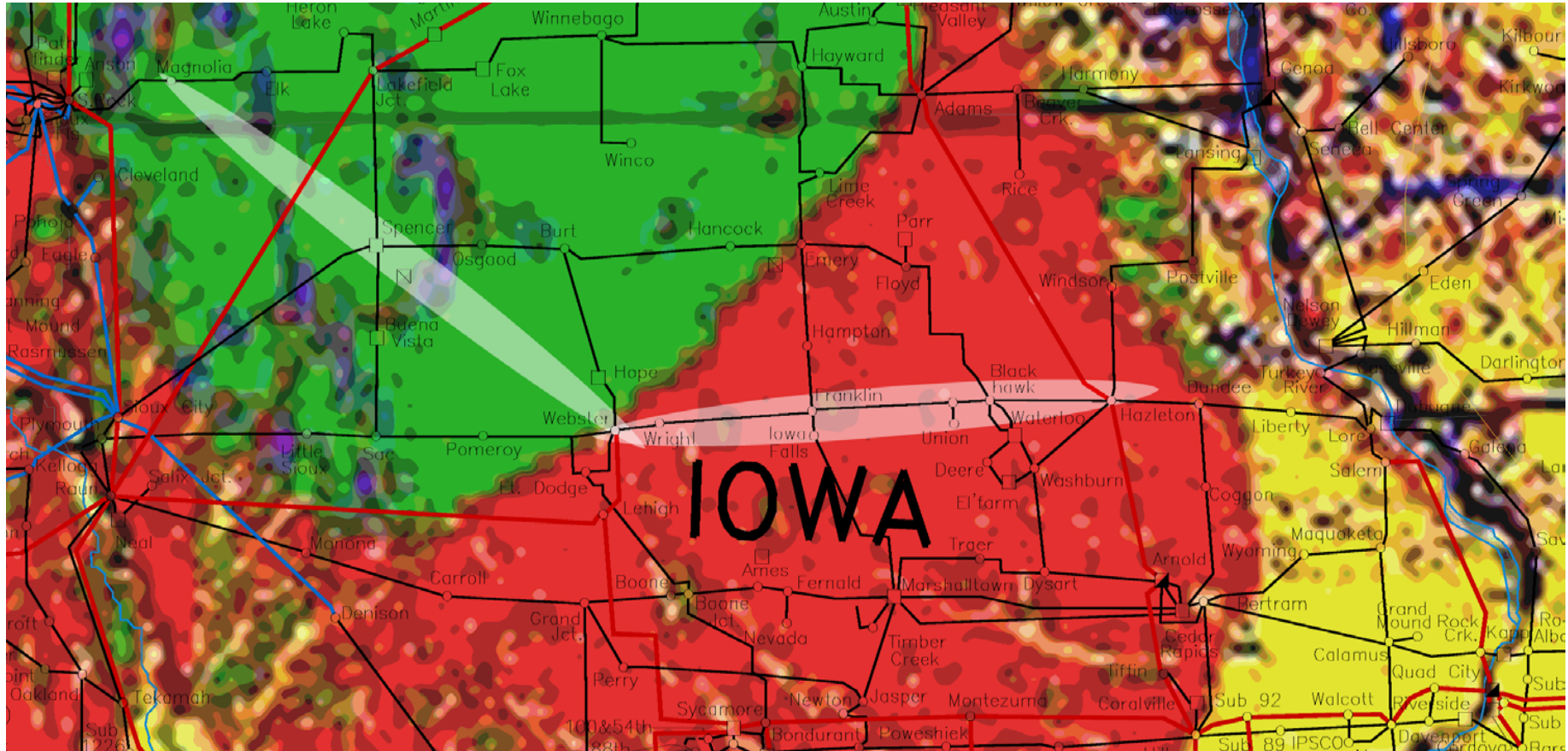
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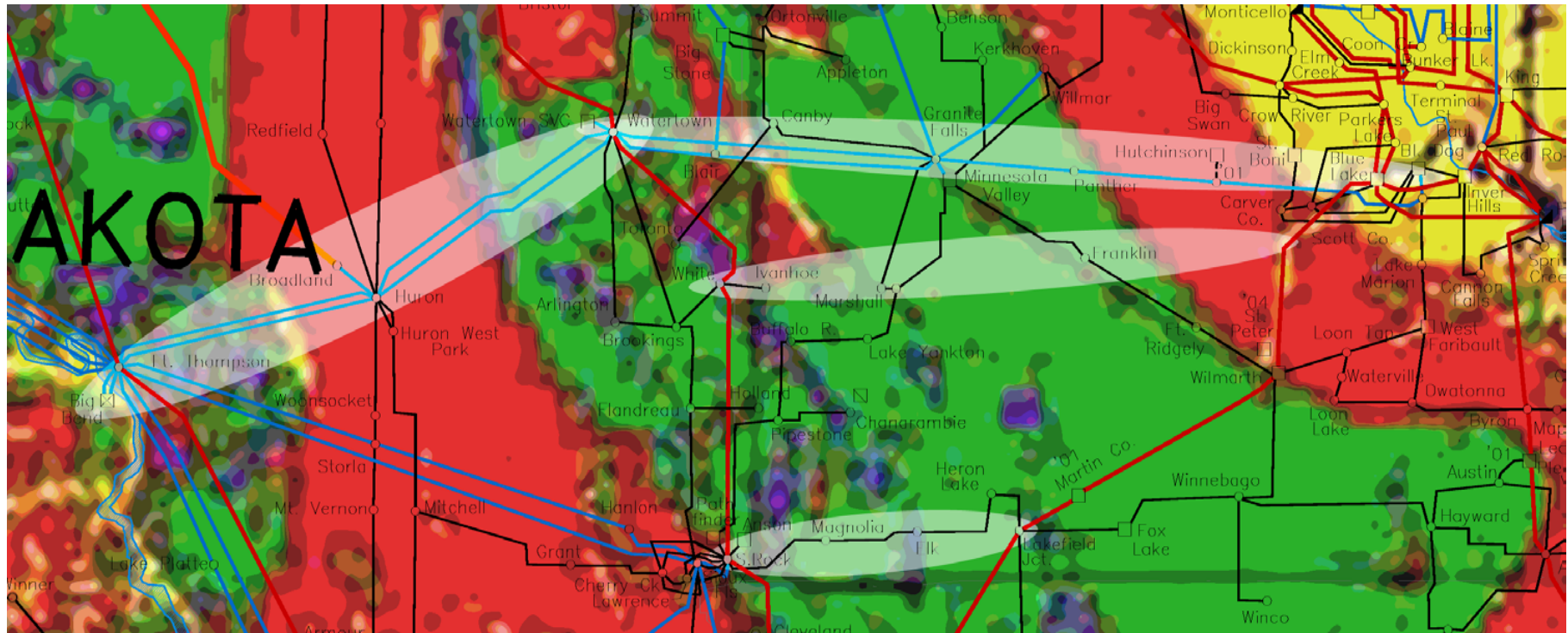
Technical

- identify the physical bottlenecks in the grid (engineering studies)
- pursue transmission infrastructure that will allow for new wind development
 - 3 tiers: priority upgrades, new AC, new DC
- partner with utilities and other entities currently studying transmission upgrades and parties who have projects – knit together the players and possibilities
- actively participate in regional transmission planning (numerous studies underway)

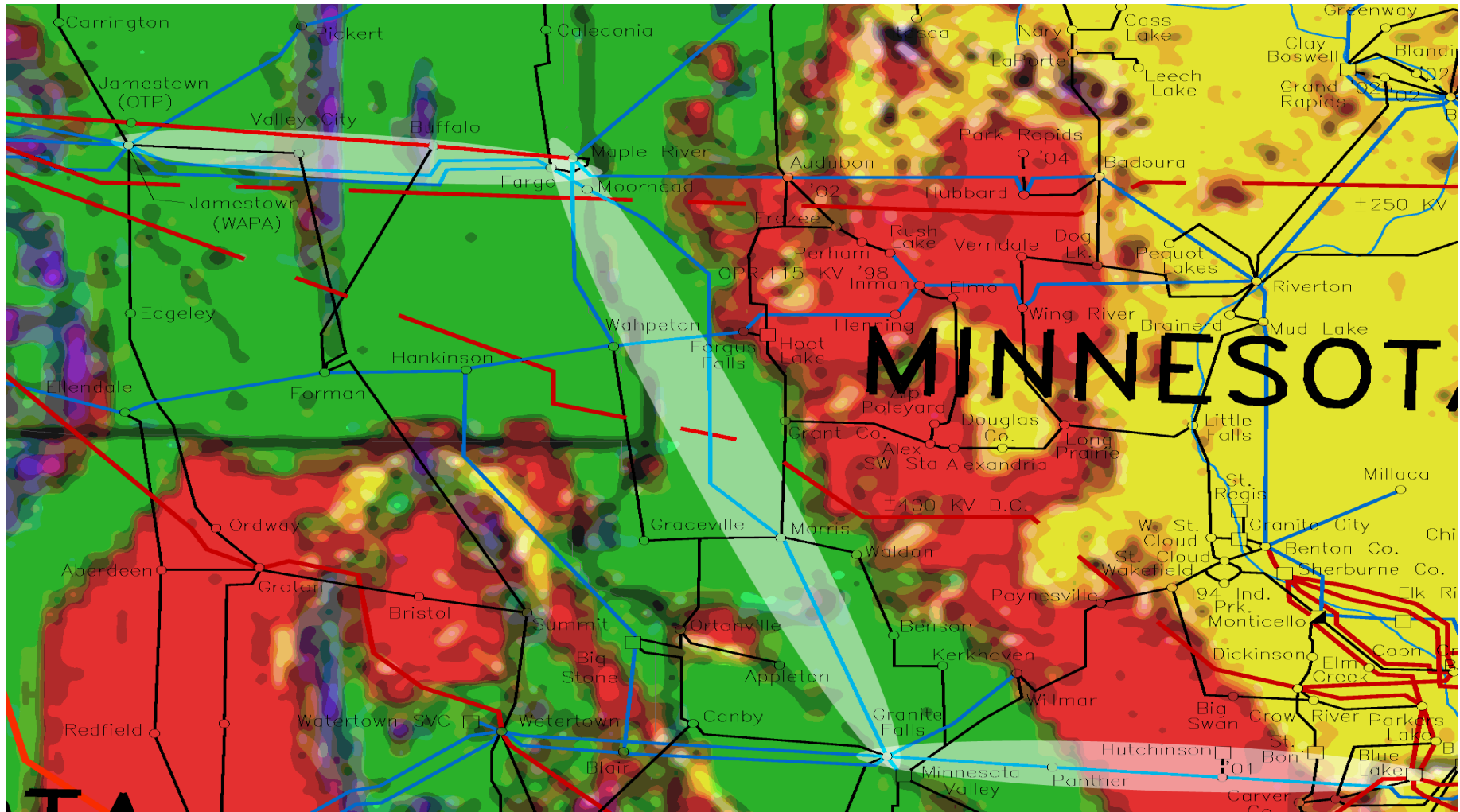
Possible Wind Transmission Routes - Southern



Possible Wind Transmission Routes - Central



Possible Wind Transmission Routes - Northern



Wind On The Wires Technical

WOW Regional Transmission Expansion Plan

- Compile “top ten” sites where wind may be developed
- Identify priority upgrades and new lines
- Research potential of distributed wind along with large central station wind
- Explore concept of “firm interruptible” transmission
 - contractual reserved capacity versus actual amount used



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Regulatory

- Premise: wind power success demands ability to sell into and deliver through commodity wholesale market in interstate commerce (AWEA)
- To date, wind power development has been treated as a network resource by utilities and has not had to face many long-distance delivery issues (delivering across multiple states)



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Regulatory

- Development and delivery of thousands of MWs of wind power will require efficient markets
- Work to ensure the rules governing the Midwest transmission system are comparable for as available resources such as wind (MAPP, MISO, TRANSLink, Alliance Companies)



Wind On The Wires Regulatory

- Participate in regulatory proceedings at the state level
 - Utilities have filed with state commissions for approval to transfer operational control of transmission to MISO
 - TRANSLink will file with state commissions in early 2002
- WOW (with AWEA and others) participating in regional market development efforts
 - Tariff design, scheduling, congestion management, i.e., “best practices”
- Participate in FERC proceedings: hearings, workshops, rulemaking, etc.

Wind On The Wires

- *Wind On The Wires* is on the ground in the 7 Upper Midwest states
- We welcome interaction with utilities, wind developers, transmission planners, tribes, local/state/federal entities, other projects and initiatives currently underway, clean energy advocates, decision makers, the public, etc.



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Regional Transmission Expansion Plan

3 month “to do” list

- Identify planned wind development sites, injection points, priority upgrades and new lines
- Distributed wind and large wind farms
- Explore concept of “firm interruptible” transmission
- Understanding “set aside” potential and transmission reservation system
- Landowner issues – equity options, compensation
- Net environmental benefits

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